The THUNDER Campaign Model

Major Russ Hodgkins

Campaign Analysis Branch
Force Analysis Division
Air Force Studies and Analyses Agency

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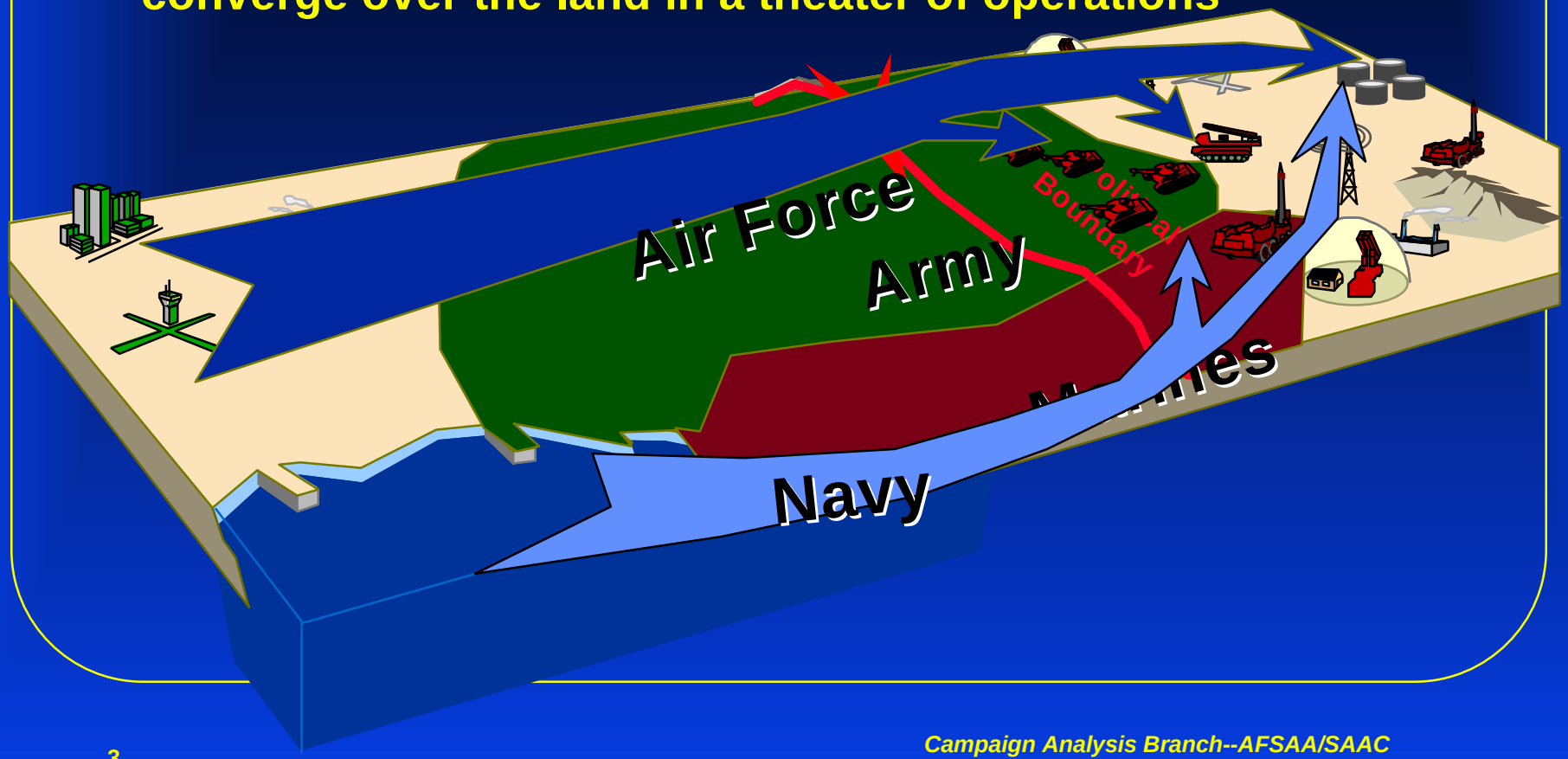
Overview

- Model Background and General Description
- Inputs
- Execution
- Outputs

THUNDER

USAF's Premier Analytic Campaign Model

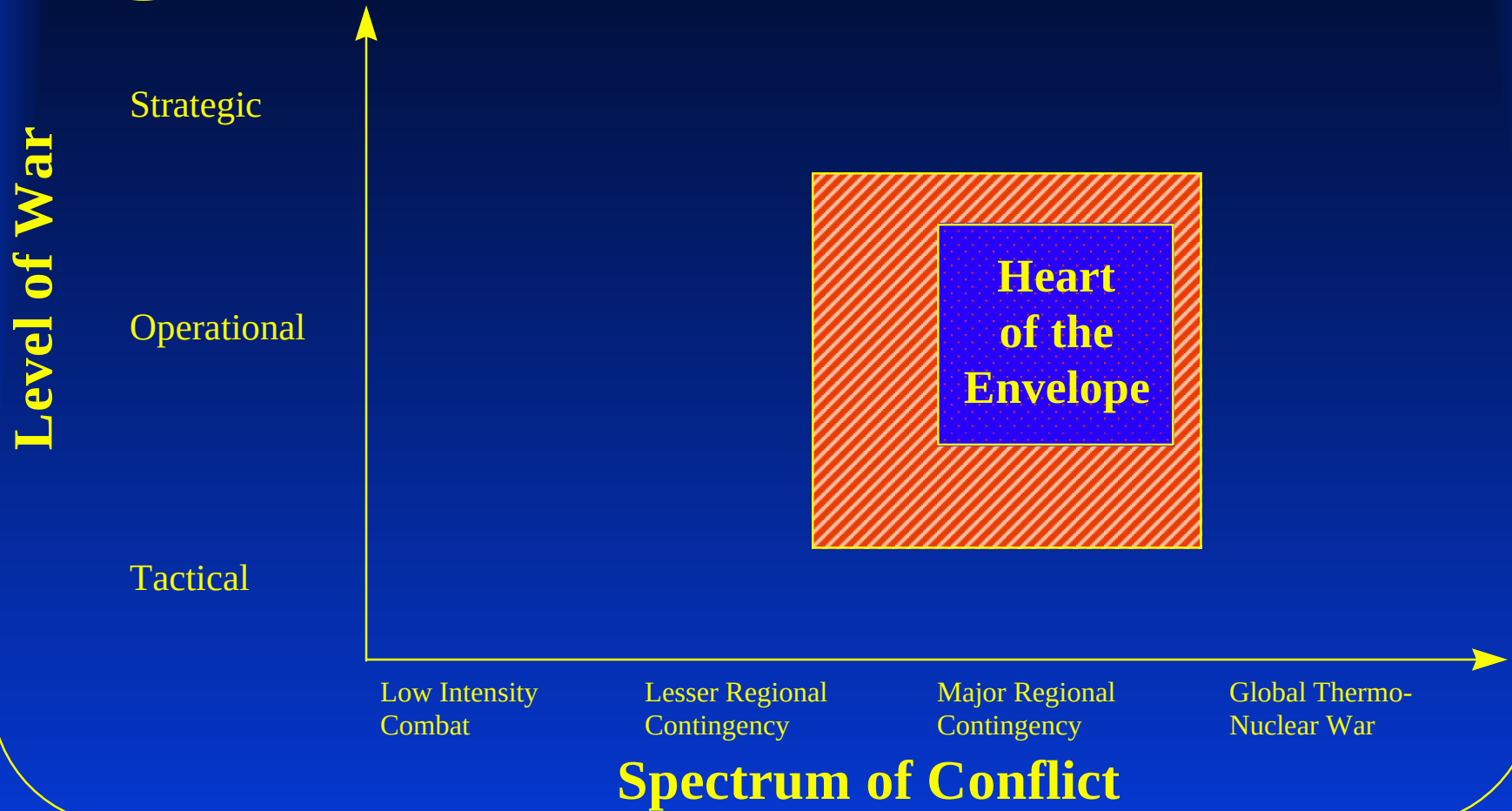
Foundation: Service warfighting perspectives converge over the land in a theater of operations



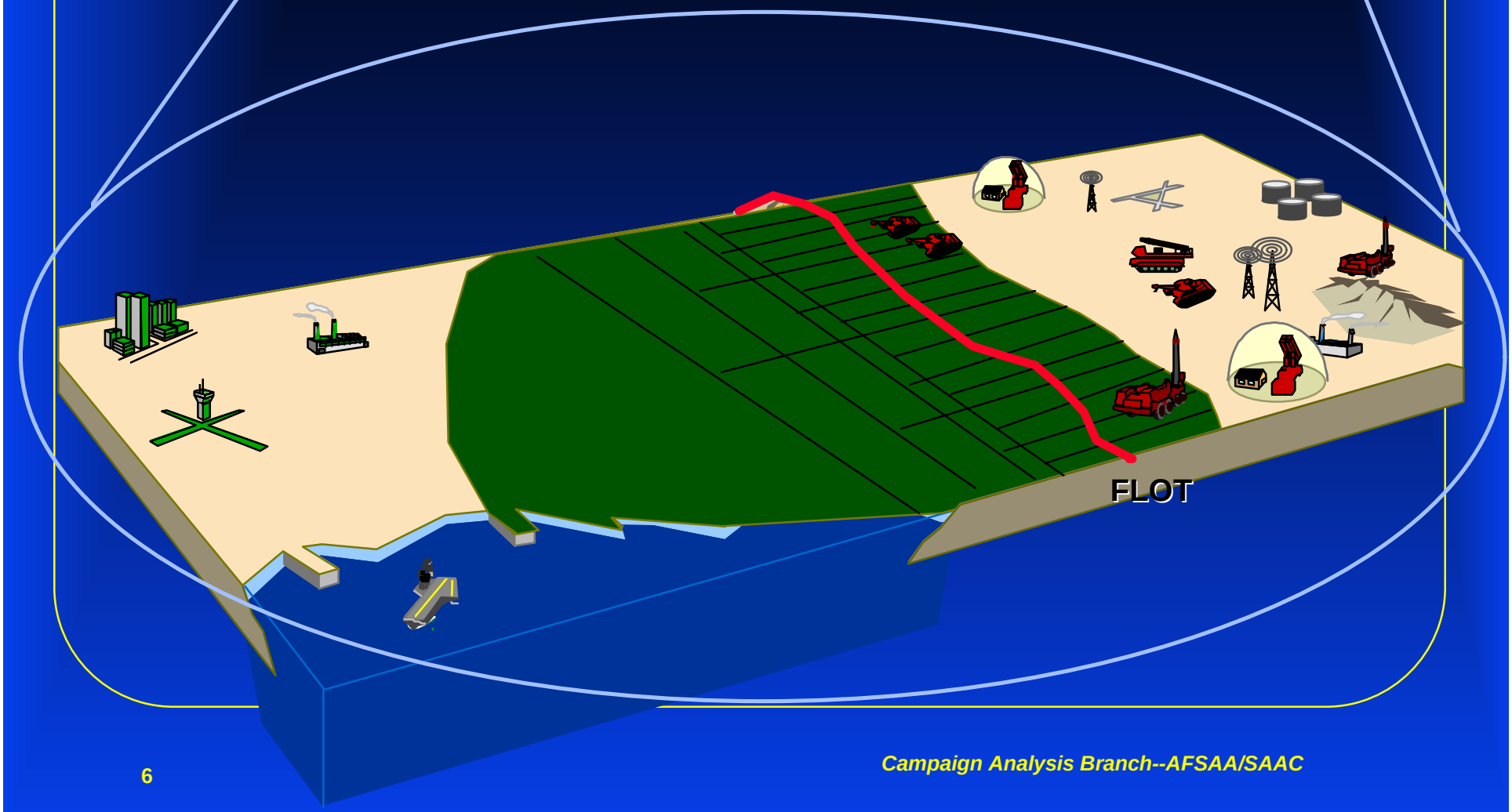
THUNDER--What is it?

- Theater level model
- Stochastic, two-sided, event sequenced
- Conventional air-land warfare; limited naval warfare
  - "Pure" naval tasks such as ASW not modeled
- Written in SIMSCRIPT II.5™
- Runs best on Sun or Silicon Graphics UNIX workstation

THUNDER Domain



Joint Force Commander's Perspective Modeled



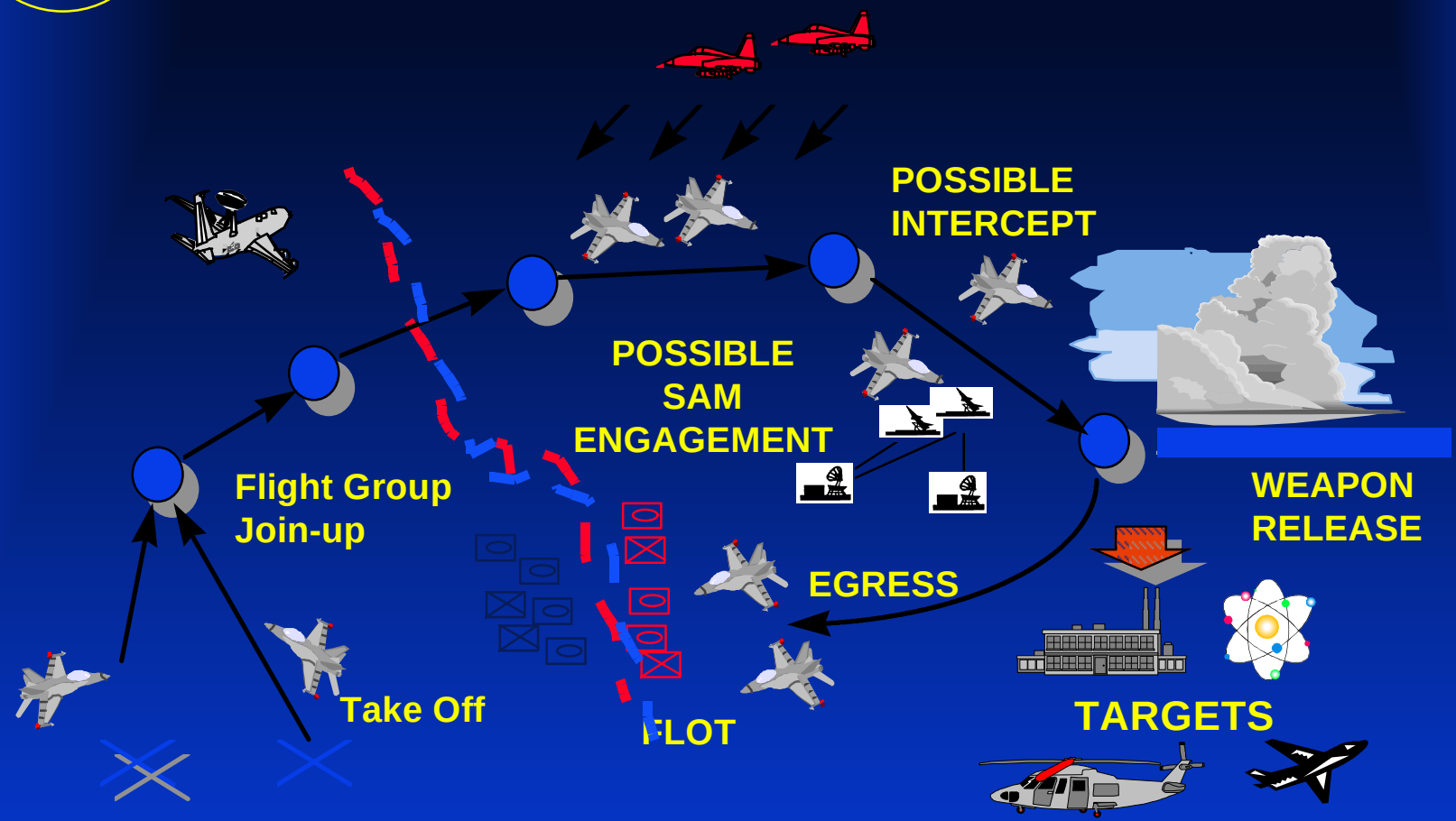
AFM 1-1 Roles and Missions Portrayed in THUNDER

Role	Mission
Aerospace Control	Counterair -Offensive -Defensive -SEAD --Destructive --Disruptive Counterspace -Offensive -Defensive
Force Application	Strategic Attack Interdiction Close Air Support
Force Enhancement	Air Refueling Electronic Combat Survellance and Reconnaissance

AFSAA
To Shed Light

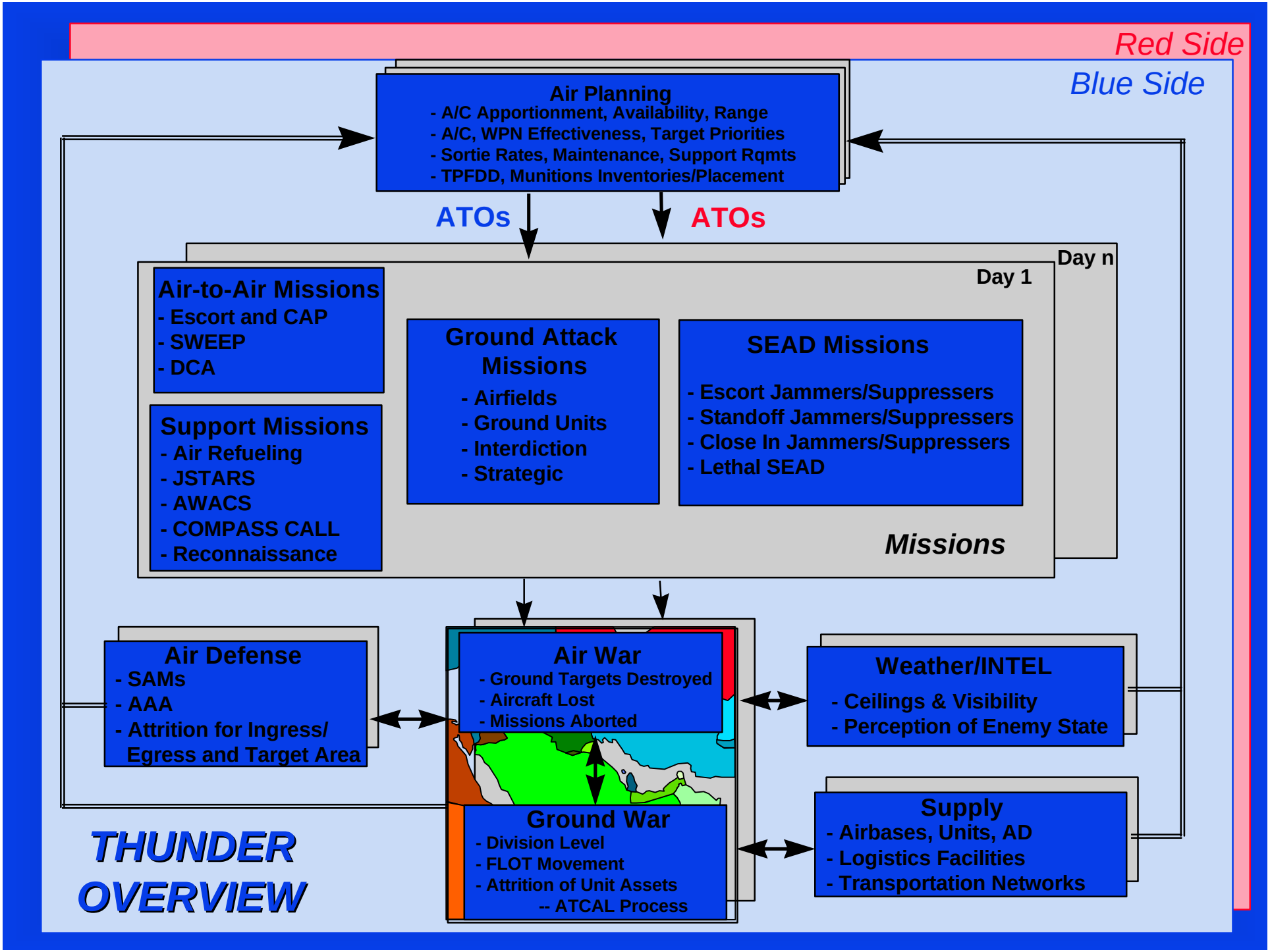
THUNDER
Airpower Players

Representative Mission



THUNDER Air Tasking Order Generation

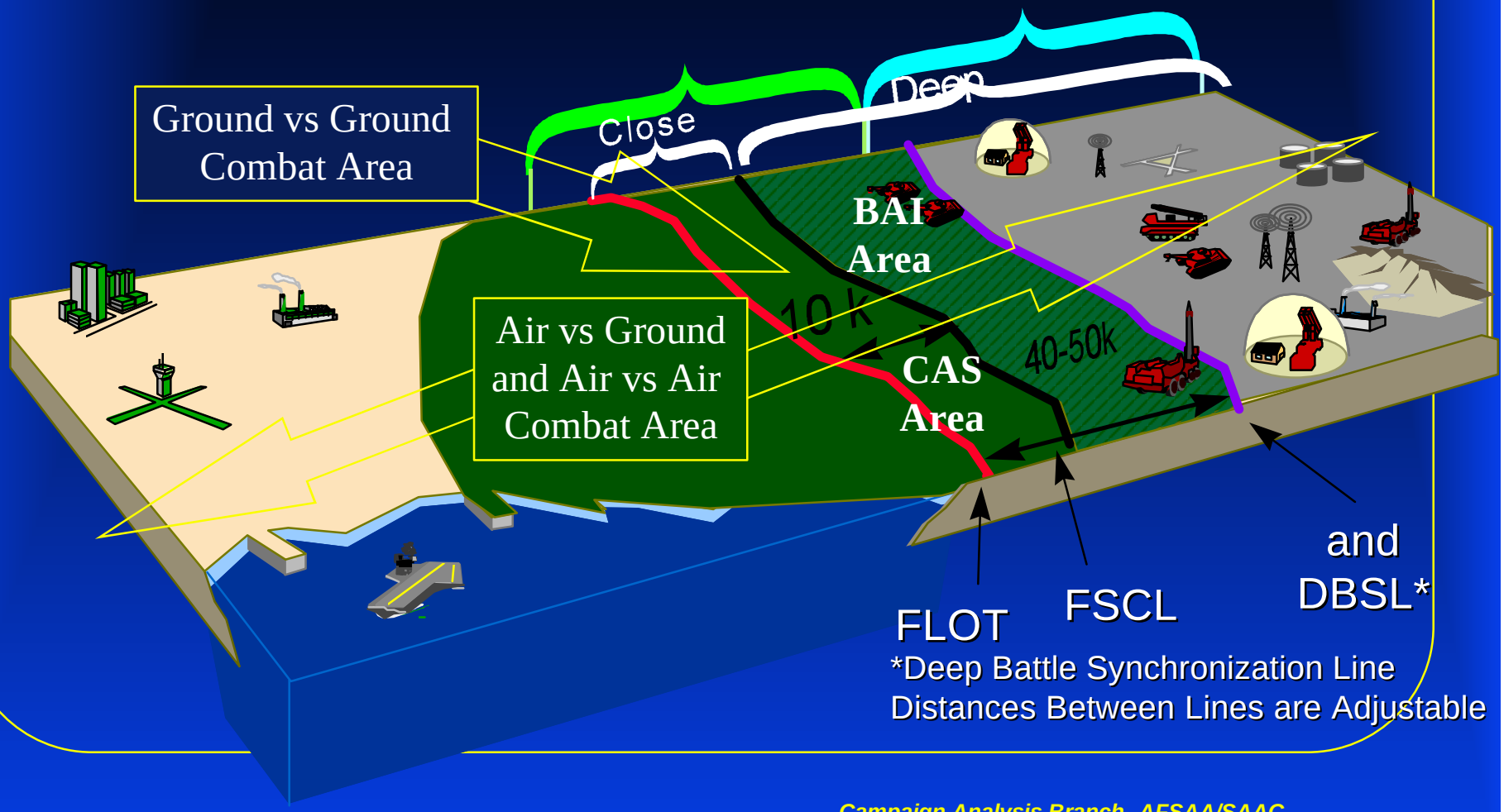
- Sophisticated embedded ATO generation available in THUNDER
  - Two-sided
  - Manual fragging also possible
- ATO process follows Joint Doctrine (JPub 3-56.1)
  - Apportionment--Input
    - » Percentage of air power to various types of missions
    - » Normally function of planning command, squadron, mission class, and time
  - Allocation--Output
    - » Model determines sorties to be flown by mission and squadron
  - Distribution--Output
    - » Distributed sorties to highest priority targets in mission area


Red Side
Blue Side
Air Planning
- A/C Apportionment, Availability, Range
- A/C, WPN Effectiveness, Target Priorities
- Sortie Rates, Maintenance, Support Rqmts
- TPFDD, Munitions Inventories/Placement
ATOs
ATOs
Day n
Day 1
Air-to-Air Missions
- Escort and CAP
- SWEEP
- DCA
Ground Attack Missions
- Airfields
- Ground Units
- Interdiction
- Strategic
SEAD Missions
- Escort Jammers/Suppressers
- Standoff Jammers/Suppressers
- Close In Jammers/Suppressers
- Lethal SEAD
Support Missions
- Air Refueling
- JSTARS
- AWACS
- COMPASS CALL
- Reconnaissance
Missions
Air Defense
- SAMs
- AAA
- Attrition for Ingress/ Egress and Target Area
Air War
- Ground Targets Destroyed
- Aircraft Lost
- Missions Aborted
Weather/INTEL
- Ceilings & Visibility
- Perception of Enemy State
Ground War
- Division Level
- FLOT Movement
- Attrition of Unit Assets
-- ATCAL Process
Supply
- Airbases, Units, AD
- Logistics Facilities
- Transportation Networks
THUNDER OVERVIEW

THUNDER Ground War

- Based on US Army Concept and Analysis Agency's (CAA) Concept Evaluation Model (CEM)
- Ground vs Ground adjudication uses Attrition Calibration (ATCAL) methodology based on CAA's Combat Sample Generator (COSAGE) model
- Air war interacts with ground units
  - Directly -- shoot the tank
  - Indirectly -- drop bridge on ground unit's line of march

Interactions of Air and Ground Forces



*Deep Battle Synchronization Line
Distances Between Lines are Adjustable

THUNDER Integrated Air Defense

- IADS functions modeled:
  - Detection
  - Identification (implicitly modeled)
  - Assignment
  - Destruction
- Counter-IADS Tactics Available:
  - Destruction
  - Disruption
  - Saturation
  - Intimidation

THUNDER Scenarios Currently Available

- Southwest Asia--Iraq bad guy
- Northeast Asia--PDRK bad guy
- Generic Conflict Scenario (GCS)--Generic bad guy
- Long Range Regional Threat (a.k.a. “Near Peer”) scenarios under construction
- All scenarios “Data driven”
  - Scenarios, force structure, terrain, and weapon systems described in data
  - Flexible--can be reconfigured easily--relatively little “hard wired” into model

THUNDER Inputs I

- "Hard Data" -- bean counts and locations (lat/long) of "things"
  - Air orders of battle
  - Ground orders of battle and unit TO&E's
  - Air defense/missile orders of battle
  - Infrastructure data such as:
    - » Logistics Facilities
    - » Transportation Network
    - » Communications nodes
  - Strategic targets
    - » Weapons R&D
    - » Electric power
    - » National C3

THUNDER Inputs II

- "Soft Data" -- Strategy, operational art, tactics
  - Flight tactics, escort ROE, support package makeup
  - Ground unit movement orders, defensive strength, offensive potential
  - Air defense fire doctrine, degraded modes
  - Repair and engineering data
- Typically the most difficult to build
- Often subject to critiques from outside observers

THUNDER Execution

- Two modes of operation:
  - Analytic mode:
    - » Run multiple repetitions
    - » Can run in parallel on multiple CPU machine
    - » Average results for output
  - Wargame mode
    - » Run single repetition using start/stop capabilities
- Time compression:
  - Depends on complexity of scenario
    - » SWA: 1 minute of run time for each day of war
    - » NEA/GCS: 2-4 minute of run time for each day of war

Typical THUNDER Outputs

- Designed to compare combat outcomes for key operational objectives such as:
  - Gain control of the air
  - Halt the invading army
  - Destroy enemy war supporting infrastructure
  - Destroy the occupying army
  - Eject the occupying army
  - Destroy enemy leadership
  - Destroy enemy infrastructure for reconstitution
  - Manage the cost of the campaign (losses)
- Quantify weapon system contributions to these outcomes

Types of THUNDER Outputs

- Graphics
  - Graphs
  - Situation Map
- Reports
  - Air-to-Air Encounters/Kills
  - Sfc-to-Air Encounters/Kills
  - Equipment Kills
  - Munitions Expenditures
  - Who shot John?

Conclusion

- **THUNDER large model**
  - **Can do lots of things**
  - **Key to THUNDER use is limit scenario to appropriate level**
- **THUNDER is flexible model**
- **Points of Contact: AFSAA/SAAC**

Voice: (703) 697-5616/DSN 227-5616

FAX: (703) 697-1226/DSN 227-1226

E-mail: hodgkins@afsaa.hq.af.mil